# Photopyroelectric Methodology Applied to Thermal Characterization of Biodiesel and Binary Liquid Mixtures

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In this work two experimental set-ups were developed based on photopyroelectric thermal wave detection to study the thermal properties of vegetable oils, biodiesels and binary liquid mixtures. These samples have brought nowadays much interest in the academic community, mainly due to environmental problems and alternative energy sources. Using a (IPPE) cell the thermal effusivity (e) of these samples mentioned above were determined with excellent reproducibility and uncertainty of less than 5%. We have used two approaches regarding the thermal and optical conditions of both sensor and sample. The first one, using an opaque and thermally thin sensor and thermally thick sample, allows the measurement of thermal effusivity from the pyroelectric signal amplitude. The second approach, using an opaque and thermally thick sensor and thermally thick sample, allows the thermal effusivity measurement from the phase of pyroelectric signal. The other cell, (SPPE) allowed the determination of the thermal diffusivity (α). The approach we have used in this case was thermally thick sensor and sample. This approach allows to determining the thermal diffusivity from both the amplitude and the phase of the pyroelectric signal through either frequency or thickness scan. We have chosen scanning thickness mainly due to the fact that samples under investigation are liquids. The results for all samples investigated showed uncertainty less than 5%. Measurements performed on samples of precursor oil and the corresponding biodiesel showed a trend of the precursor oil presenting higher values of thermal properties when compared to the corresponding biodiesel. This behavior was more visible for the thermal diffusivity. Finally we apply the methodology in binary liquid mixtures. The technique is suitable to identify the degree of molecular association in liquid mixtures associative and non-associative as well as biodiesel in diesel oil mixtures.